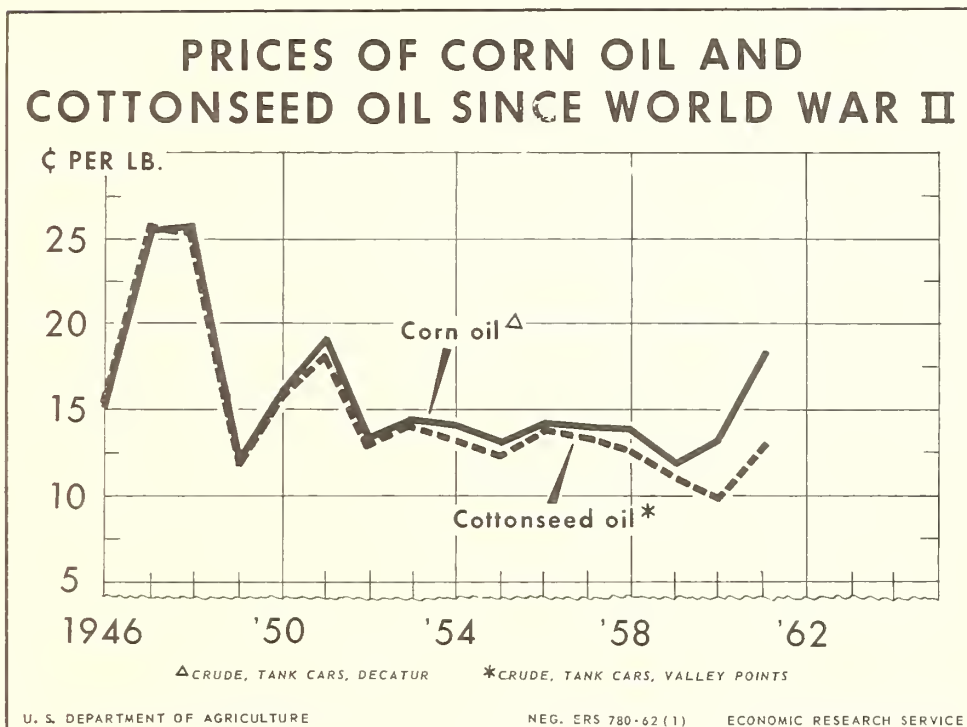


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USE OF CORN OIL IN MARGARINE EXPANDING RAPIDLY

By
George W. Kromer



Cottonseed oil is the predominant liquid salad and cooking oil in the United States. During 1946-59, corn oil prices were determined primarily by the price of the more abundant cottonseed oil. Since 1959, the use of corn oil in margarine manufacture has expanded greatly, without a corresponding increase in corn oil output. (Corn oil supplies are a

byproduct from the wet-process grindings of corn and thus are unresponsive to demand changes for oil.) With increased demand for corn oil the usual corn oil-cottonseed oil price ratio has been disrupted. Corn oil prices averaged 38 percent higher than cottonseed oil in 1960 and 1961. (See page 26.)

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Corn oil output, a byproduct primarily of the corn refining or wet milling industry, has more than doubled in the last 2 decades, rising from about 151 million pounds in calendar year 1939 to a record 331 million in 1961. Consumption of corn oil has shown a similar trend and this year likely will set a new record.

Historically, nearly all crude corn oil has been refined and used mainly as a cooking oil and salad oil. Since 1957, corn oil utilized in the manufacture of margarine has jumped from less than 1 million pounds to about 90 million pounds in 1961. Refined corn oil is among the oils relatively high in polyunsaturated fatty acid, linoleic, an essential dietary substance. However, the debate over the significance of poly-unsaturation as opposed to saturated oils is far from settled. The introduction of several new brands of corn oil margarine along with a vigorous merchandising and promotional campaign by industry has boosted the demand for these products. As a consequence, demand for corn oil has exceeded available supplies and monthly average prices (crude, Decatur) rose steadily from 11.2 cents per pound in November 1959 to 24.7 cents in November 1961. Prices in mid-January 1962 averaged 21.0 cents per pound, about 6.0 cents above last year.

Corn oil is produced as a byproduct of three of the corn-using industries. "Dry" millers make breakfast foods, corn meal, hominy, grits, flour, feed and oil; "wet" millers, or corn refiners, manufacture starch, syrup, sugar, feed, and oil; distillers make whiskey and industrial alcohol.

Wet-Process Grindings of Corn Trend Upward Slowly

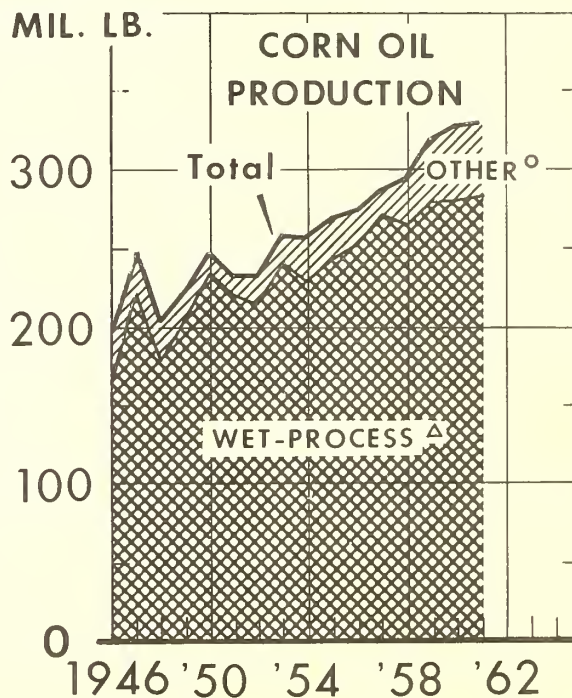
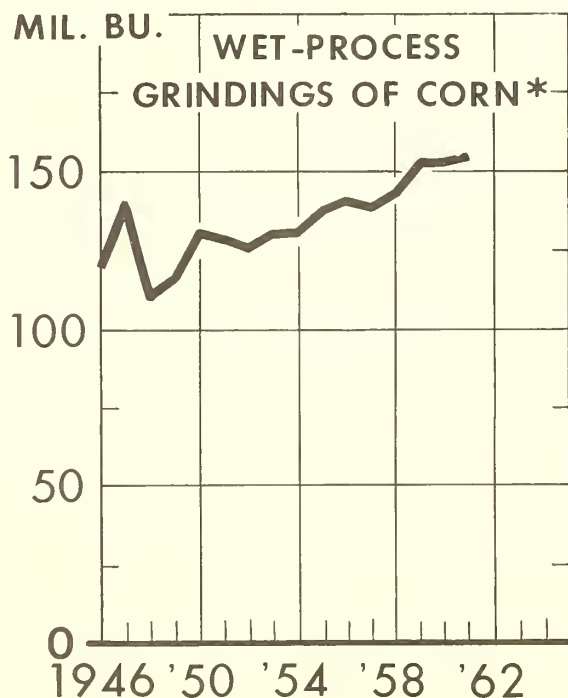
Wet milling of corn refers to the manufacturing process which accomplishes the separation of the germ, hull, gluten and starch from the corn kernel by the use of water as a suspension medium. The main product, corn-starch, is a basic raw material for modified starches and refinery products such as syrup and sugar. (For a more comprehensive description of the wet milling process, see article entitled, "Corn Oil Production and Utilization," which appeared in the September 1959 issue of the Fats and Oils Situation, FOS-198, pps 31-39.)

The corn germ separated by the wet-process contains much less of the other parts of the corn than that obtained by the dry-process, with the result that about half of it is oil. A 56-pound bushel of hybrid yellow dent corn degermed by the wet process yields around 1.8 pounds of oil on the average (table 19). In dry milling, less than half as much oil is extracted from the germ stock.

The volume of corn ground by wet millers has shown a gradual long-run uptrend, about doubling from 77 million bushels in calendar year 1939 to a record 155 million bushels estimated for 1961. The rate of grind has been influenced by the increased demand for corn products during World War II and the Korean conflict along with the development of new and improved uses of corn products in recent years.

The growth in wet-process grindings of corn has naturally resulted in increased output of corn oil. Based on shipments of corn oil by the wet-process industry, corn refiners in recent years have accounted for about 85-90 percent of the total corn oil output. Data are not available on the quantity of corn oil produced by dry millers and distillers but the volume apparently is relatively small. Total production of corn oil has more than doubled in the last 20 years, rising from 151 million pounds in calendar year 1939 to a record 331 million pounds estimated for 1961 (table 19). Production of corn oil may be expected to expand or contract in direct proportion with general activity in the corn refining industries. However, the demand for corn starch is fairly stable and tends to rise only with population growth. At the present time, there are 11 companies in the wet-milling industry.

CORN AND CORN OIL



* USED IN PRODUCTION OF STARCH, SYRUPS, SUGAR, FEED AND OIL FROM CORN GRAIN.

△ ESTIMATED

○ PRINCIPALLY FROM THE DRY MILLING AND DISTILLING INDUSTRIES.

1961 ESTIMATED.

Table 18.--Corn germs: Supply, disposition, and production of oil and meal, 1947-60

| Year beginning October | Supply | | | Disposition | Production of | | | |
|------------------------------|--------------------------------------|-----------------------------------------------------|---------------|-------------------|----------------------------|------------------------------|------------------------|------------------------------|
| | Apparent production 1/ tons | Stocks at crushing mills October 1 tons | Total tons | Crushings tons | Oil | | Meal | |
| | | | | | Total Million pounds | Per ton crushed Pounds | Total 1,000 tons | Per ton crushed Pounds |
| 1947 | 270 | .7 | 271 | 270 | 204 | 756 | --- | --- |
| 1948 | 299 | .5 | 300 | 299 | 225 | 753 | 113 | 1,010 |
| 1949 | 318 | .9 | 319 | 318 | 242 | 761 | 160 | 1,057 |
| 1950 | 325 | 1.2 | 326 | 325 | 243 | 746 | 176 | 1,003 |
| 1951 | 303 | 1.7 | 305 | 302 | 223 | 730 | 164 | 1,086 |
| 1952 | 321 | 1.1 | 322 | 321 | 250 | 804 | 166 | 1,034 |
| 1953 | 319 | .9 | 320 | 319 | 252 | 790 | 164 | 1,028 |
| 1954 | 327 | 1.1 | 328 | 327 | 260 | 820 | 158 | 966 |
| 1955 | 322 | .9 | 323 | 322 | 270 | 839 | 149 | 925 |
| 1956 | 372 | .9 | 373 | 372 | 266 | 770 | 180 | 969 |
| 1957 | 407 | 1.9 | 409 | 406 | 291 | 718 | 206 | 1,014 |
| 1958 | 471 | 1.9 | 473 | 471 | 315 | 670 | 234 | 994 |
| 1959 | N.A. | 1.4 | N.A. | 482 | 332 | 609 | 214 | 886 |
| 1960 2/ | N.A. | 2.1 | N.A. | N.A. | 331 | N.A. | N.A. | N.A. |

1/ Estimated from crushings and change in stocks. 2/ Preliminary.

Totals computed from unrounded numbers.

Table 19.--Corn oil: Wet-process grindings of corn, oil production, and prices, 1939-61

| Calendar year | Corn | Corn oil production | | | | Corn oil prices | |
|------------------|-----------------------------------------------|----------------------------|----------------|-------------------------------|----------------------------------------------------|---------------------------------------|--------------------------------------|
| | Wet- process grindings 1/ bushels | Total Million pounds | Wet-process 2/ | | Yield per bushel of corn ground Pounds | Crude, tank cars, Decatur Cents | Refined, drums, N. Y. Cents |
| | | | Total | Percent of total output | | | |
| 1939 | 77 | 151 | 135 | 89 | 1.8 | 5.9 | 0.6 |
| 1940 | 82 | 158 | 158 | 100 | 1.9 | 5.7 | 8.2 |
| 1941 | 110 | 203 | 167 | 82 | 1.5 | 10.0 | 13.0 |
| 1942 | 130 | 248 | 241 | 97 | 1.9 | 12.7 | 16.1 |
| 1943 | 128 | 239 | 222 | 93 | 1.7 | 12.8 | 16.2 |
| 1944 | 120 | 211 | 187 | 89 | 1.6 | 12.8 | 16.4 |
| 1945 | 119 | 205 | 174 | 85 | 1.5 | 12.8 | 16.6 |
| 1946 | 121 | 198 | 167 | 84 | 1.4 | 15.6 | 20.1 |
| 1947 | 139 | 247 | 222 | 90 | 1.6 | 25.7 | 32.4 |
| 1948 | 110 | 203 | 170 | 88 | 1.6 | 25.7 | 33.4 |
| 1949 | 116 | 224 | 209 | 93 | 1.8 | 12.2 | 18.1 |
| 1950 | 131 | 248 | 235 | 95 | 1.8 | 16.0 | 21.4 |
| 1951 | 129 | 232 | 221 | 95 | 1.7 | 19.0 | 25.0 |
| 1952 | 126 | 232 | 216 | 93 | 1.7 | 13.3 | 18.8 |
| 1953 | 130 | 259 | 242 | 93 | 1.9 | 14.1 | 20.0 |
| 1954 | 131 | 255 | 230 | 90 | 1.8 | 14.0 | 20.9 |
| 1955 | 138 | 268 | 244 | 91 | 1.8 | 13.0 | 20.2 |
| 1956 | 141 | 272 | 252 | 93 | 1.8 | 14.1 | 20.8 |
| 1957 | 139 | 288 | 271 | 94 | 1.9 | 13.8 | 20.1 |
| 1958 | 144 | 296 | 266 | 90 | 1.8 | 13.4 | 4/16.7 |
| 1959 | 153 | 321 | 282 | 88 | 1.8 | 11.8 | 15.4 |
| 1960 3/ | 153 | 330 | 281 | 85 | 1.8 | 13.1 | 16.8 |
| 1961 5/ | 155 | 331 | 285 | 86 | 1.8 | 18.2 | 22.1 |

1/ Used in the production of starch, syrups, sugar, feed and oil from corn grain. 2/ Based on oil sold by wet-process industry. 3/ Preliminary. 4/ Beginning April 1958 reported as tanks. 5/ Partly estimated.

Most of the crude corn oil is refined to produce a food oil. Refined corn oil closely resembles cottonseed and soybean oils. Techniques used for refining, blending, and deodorizing are in general similar to those employed for other vegetable oils. However, a cooking and filtering step is necessary in the processing to free the oil of natural waxes, which if allowed to remain, would separate gradually and make the oil cloudy. In refining corn oil, the crude oil is treated with alkali to neutralize the fatty acids and also improve the color. The refining process separates corn oil "foots"; these are used by the soap industry.

Refined corn oil, pale yellow and crystal-clear, has special qualities that make it excellent as a cooking and salad oil. It is used either directly as such or as a base for mayonnaise, salad dressing, margarine, shortening, and other products containing oil. The low cloud point and melting point of corn oil and its good keeping quality favor its use for these purposes. Other food uses for corn oil include deep-fat frying of doughnuts, potatoes, and in the production of potato chips, bakery products, and so on.

Nonfood uses of corn oil include the manufacture of soap, insecticides, and the products of the leather and textile industries.

Total Consumption of Corn Oil Rises Slowly but
Utilization in Margarine Up Sharply

Domestic disappearance of corn oil has also displayed a fairly gradual increase, rising from around 150 million pounds two decades ago to 358 million pounds during 1960-61, the largest volume of record. Domestic production has failed to keep pace with the rising requirements of the domestic markets and in recent years imports have increased. Imports, mainly from Europe, rose from 6 million pounds in 1957-58 to 22 million in 1960-61 (table 20).

During recent years, 91-93 percent of our corn oil has been utilized in food products and the balance went into nonfood uses, primarily as foots. This consumption pattern is likely to continue, as the special inherent qualities of corn oil are highly desirable in cooking and salad oil and margarine. Most refined corn oil is marketed directly as packaged goods for the retail trade but margarine manufacture is becoming an increasingly important outlet for this commodity.

The use of corn oil in margarine increased from a mere 1 million pounds in 1957-58 to a record 82 million in 1960-61 accounting for a 0.3 percent of the total U. S. consumption in the earlier period compared with 23 percent in 1960-61. Data so far for 1961-62 indicate that the proportion of corn oil used in margarine will be even greater than last year. The upsurge in demand for corn oil in margarine coupled with the inability to adjust corn oil output to meet shifts in the demand schedule has resulted in a reduction in the quantities used in salad and cooking oils (table 21).

Table 20.--Corn Oil: Supply and disposition, 1947-60

| Year begin- ning October | Supply | | | | Disposition | |
|-----------------------------------|------------|-----------|---------------------|----------|---------------------------------------|---------------------------|
| | Production | Imports | Stocks October 1 | Total | Exports and shipments <u>1/</u> | Domestic disappearance |
| | Mil. lb. | Mil. lb. | Mil. lb. | Mil. lb. | Mil. lb. | Mil. lb. |
| 1947 | 204 | --- | 13 | 217 | <u>2/</u> | 207 |
| 1948 | 225 | --- | 10 | 235 | <u>2</u> | 222 |
| 1949 | 242 | <u>2/</u> | 11 | 253 | <u>2</u> | 233 |
| 1950 | 243 | <u>2/</u> | 18 | 261 | <u>3</u> | 247 |
| 1951 | 223 | <u>2/</u> | 12 | 235 | <u>2/</u> | 222 |
| 1952 | 256 | <u>2/</u> | 12 | 270 | --- | 254 |
| 1953 | 252 | --- | 16 | 268 | --- | 253 |
| 1954 | 266 | 1 | 15 | 284 | --- | 265 |
| 1955 | 270 | --- | 19 | 289 | --- | 267 |
| 1956 | 266 | --- | 23 | 309 | --- | 293 |
| 1957 | 291 | 6 | 16 | 313 | --- | 289 |
| 1958 | 315 | 10 | 25 | 350 | --- | 327 |
| 1959 | 332 | 12 | 24 | 368 | --- | 329 |
| 1960 <u>3/</u> | 331 | 22 | 39 | 391 | --- | 358 |
| 1961 | | | 33 | | | |

1/ Includes exports under voluntary relief programs in 1948-49. 2/ Less than 500,000 pounds.

3/ Preliminary.

Totals computed from unrounded numbers.

Table 21.--Corn Oil: Utilization, year beginning October, 1947-60

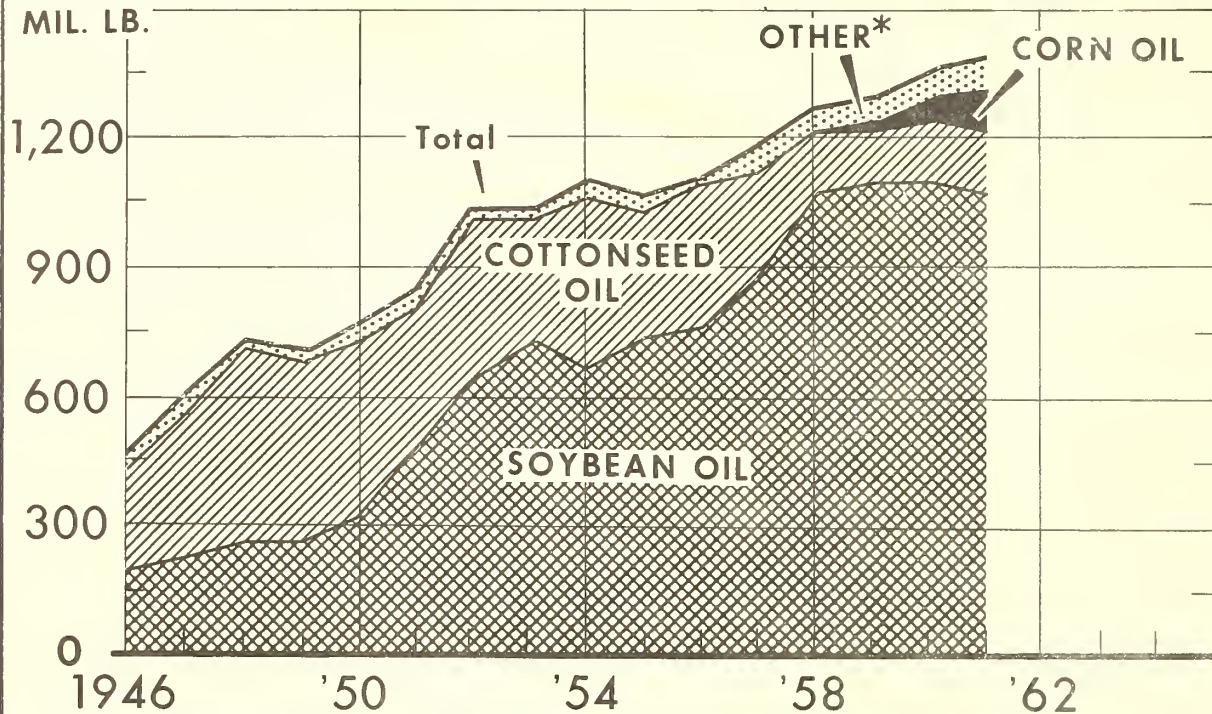
| Year begin- ning October | Food uses | | | | Non-food uses | | | | Total domestic disap- pearance |
|-----------------------------------|-----------------|-----------|--------------------------------|----------------|---------------|----------------------|----------------|---------|-----------------------------------------|
| | Short- ening | Margarine | Salad and cooking oil | Other Total | Soap | Foots and loss | Other Total | | |
| | Mil.lb. | Mil.lb. | Mil.lb. | Mil.lb. | Mil.lb. | Mil.lb. | Mil.lb. | Mil.lb. | |
| 1947 | 3 | 3 | 178 | 183 | <u>1/</u> | 17 | 7 | 24 | 207 |
| 1948 | 1 | 1 | 201 | 203 | <u>1/</u> | 17 | 2 | 19 | 222 |
| 1949 | <u>1/</u> | <u>1/</u> | 215 | 215 | <u>1/</u> | 16 | 2 | 18 | 233 |
| 1950 | <u>1/</u> | <u>1/</u> | 224 | 224 | <u>1/</u> | 20 | 3 | 23 | 247 |
| 1951 | 1 | <u>1/</u> | 197 | 198 | <u>1/</u> | 22 | 2 | 24 | 222 |
| 1952 | 1 | 1 | 229 | 231 | <u>1/</u> | 21 | 3 | 24 | 254 |
| 1953 | 1 | <u>1/</u> | 229 | 231 | <u>1/</u> | 20 | 2 | 22 | 253 |
| 1954 | 3 | <u>1/</u> | 231 | 234 | <u>1/</u> | 30 | 2 | 31 | 265 |
| 1955 | 2 | 1 | 243 | 246 | 0 | 19 | 1 | 20 | 267 |
| 1956 | 2 | <u>1/</u> | 270 | 273 | 0 | 19 | 1 | 20 | 293 |
| 1957 | 4 | 1 | 261 | 265 | 0 | 22 | 1 | 23 | 289 |
| 1958 | 5 | 13 | 208 | 77 303 | 0 | 23 | <u>1/</u> | 23 | 327 |
| 1959 | 6 | 39 | 250 | 4 299 | 0 | 27 | <u>3</u> | 30 | 329 |
| 1960 <u>2/</u> | 11 | 82 | 224 | 8 326 | 0 | 30 | 2 | 32 | 358 |
| 1961 | | | | | | | | | |

1/ Less than 500,000 pounds.

2/ Preliminary.

Totals computed from unrounded numbers.

FATS AND OILS USED IN MARGARINE



*MAINLY LARD BUT ALSO INCLUDES BEEF FATS, PEANUT OIL, COCONUT OIL AND VEGETABLE STEARINE
1961 DATA PARTLY ESTIMATED

U. S. DEPARTMENT OF AGRICULTURE

NEG. ERS 781-62 (1) ECONOMIC RESEARCH SERVICE

Corn Oil Margarine Demand Upsets Classical Corn Oil-Cottonseed Oil Price Ratio

Corn oil prices (crude, Decatur) were relatively stable during 1952-60, the average annual price varying between 12 and 14 cents per pound. During this period, corn oil was utilized almost exclusively as a salad and cooking oil and in the manufacture of miscellaneous food products. Cottonseed oil predominates in these fields and the price of corn oil varied in close conformity with changes in prices of cottonseed oil and other competing food oils. Prices of crude corn oil ran just a shade (2 percent) above prices of crude cottonseed oil. During the postwar period (except for recent years), price changes in these two oils not only have moved together in the same direction each year but the rate of change for both commodities from the preceding year also was nearly identical.

In 1961, corn oil prices soared to an annual average of 18.2 cents per pound--40 percent higher than cottonseed oil--as the aggregate demand for corn oil outstripped available supplies (see cover chart). Apparently sales of the corn oil margarine brands are quite brisk and continue to increase. The industry has conducted a vigorous introductory merchandising and promotional campaign, which has certainly been a factor in boosting the demand for these products.

The demand for corn oil margarines is expected to remain high and likely will continue to expand but perhaps at a slower rate than witnessed up to this point. The classical corn oil-cottonseed oil price ratio (102 percent) no longer holds as corn oil likely will continue to command a price premium over cottonseed oil, mainly because of the inability to alter corn oil output in response to changes in demand. Other factors affecting the supply and price outlook include (1) increased availability and competition from lower-priced substitutes--mainly safflower oil, a primary product which has even a higher poly-unsaturated fatty acid content than corn oil and, (2) only a few producers of corn oil (some of which make margarine) whereas there is a large number of buyers of corn oil for use in margarine manufacture.

In summary, the outlook is for a steadily growing demand for corn oil at premium prices compared with cottonseed oil, mainly because of product differentiation in the margarine and salad and cooking oil field. However, safflower oil likely will become increasingly important in the food oil field and this probably will relieve some of the upward pressure on corn oil prices such as witnessed in 1961. While the demand for corn oil is strong and prices relatively high, it is quite unlikely that this favorable situation and outlook will have much influence, if any, on the rate of corn ground by the wet-process industry.

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